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THE DIRECTOR

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MEMORANDUM FOR THE HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES

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SUBJECT: Science and Technology Priorities for the FY 2012 Budget

Scientific discovery, technological breakthroughs, and innovation are major engines for expanding the frontiers of human knowledge and are indispensable for promoting sustainable economic growth, improving the health of the population, moving toward a clean energy future, addressing global climate change challenges, managing competing demands on the environment, and safeguarding our national security.

This memorandum follows up on OMB Memorandum M-10-19 by outlining the Administration's science and technology (S&T) priorities for formulating FY 2012 Budget submissions to the Office of Management and Budget (OMB). These priorities for research and development (R&D) investments and other S&T investments build on priorities already reflected in the American Recovery and Reinvestment Act, the FY 2010 and 2011 Budgets, and key Administration policy guidance such as the President's *Strategy for American Innovation*. This memorandum also provides program guidance for S&T activities in Executive Departments and Agencies.

Prioritizing key S&T activities

Agencies should explain in their budget submissions how they will redirect available resources, as appropriate, and consistent with their mission, from lower-priority areas to S&T activities that address six challenges and strengthen six cross-cutting areas (outlined in Attachment A) that underlie success in addressing all of these challenges. Agencies should describe expected outcomes from these S&T investments, providing quantitative metrics where possible.

Program Guidance

The President has a long-term goal that the R&D investment (both private and Federal) in the United States should reach three percent of the Gross Domestic Product (GDP). In order to understand the status of the Federal share of this goal, agencies are expected to work in close collaboration with OMB and OSTP to accurately classify and report R&D investment activities.

Agencies should pursue transformational solutions to the Nation's practical challenges, and budget submissions should therefore explain how agencies will support long-term, visionary thinkers

proposing high-risk, high-return (or “potentially transformative”) research. Some of this research should be motivated by the “grand challenges” of the 21st century, such as those identified by the President’s *Strategy for American Innovation* and the National Academy of Engineering.

Agencies should encourage and rigorously evaluate new approaches to supporting multidisciplinary research, such as the convergence of bio-, info-, and nanotechnologies; and new approaches for accelerating technology commercialization and innovation, including incentive prizes, university-industry partnerships, proof-of-concept centers, and regional innovation clusters.

Interagency and international collaborations on large-scale S&T projects can benefit partnering organizations, but too often agencies enter such partnerships only because each individual agency cannot accommodate funds within its own budget request, leading to management challenges. In requesting funds for large-scale S&T projects involving significant interagency or international collaboration, agencies should identify: the lead organization for the collaboration; the unique capabilities brought to the collaboration by each partnering organization; and specific roles and responsibilities for each organization. Agencies should coordinate with partner Federal agencies to formulate budget requests for interagency collaborations.

Agencies, in cooperation with OSTP and OMB, should develop and sustain datasets to better document Federal science, technology, and innovation investments and to make these data open to the public in accessible, useful formats. Agencies should develop and regularly update their data sharing policies for research performers and create incentives for sharing data publicly in interoperable formats to ensure maximum value, consistent with privacy, national security, and confidentiality concerns.

Agencies should develop outcome-oriented goals for their science, technology, and innovation activities, establish timelines for evaluating the performance of these activities, and target investments toward high-performing programs in their budget submissions. Agencies should support the development and use of “science of science policy” tools that can improve management of their R&D portfolios and better assess the impact of their science, technology, and innovation investments.

Agencies should implement strategies for increasing the benefits for science and society derived from scientific collections by following the recommendations in the report by the Interagency Working Group on Scientific Collections and efforts outlined in the National R&D Strategy for Microbial Forensics.

Finally, agencies are expected to conduct programs in accordance with the highest standards of ethical and scientific integrity and to have clear principles, guidelines, and policies on issues such as scientific openness, scientific misconduct, conflicts of interest, protection of privacy, and the appropriate treatment of human subjects.

Appendix A

Challenges and Areas to be Strengthened

In the 2012 Budget, agencies should focus resources on addressing these six challenges:

Promoting sustainable economic growth and job creation

- Support R&D in advanced manufacturing to strengthen U.S. leadership in the areas of robotics, cyber-physical systems, and flexible manufacturing.
- Support research to establish the foundations for a 21st century “bio-economy.” Advances in biotechnology and improvements in our ability to design biological systems have the potential to address critical national needs in agriculture, energy, health, and the environment.
- Support two specific areas within existing interagency efforts: the National Nanotechnology Initiative’s signature initiatives and the Networking and Information Technology Research and Development (NITRD) initiative’s focus on research to improve our ability to derive value and scientific inferences from enormous quantities of data.

Defeating the most dangerous diseases and achieving better health outcomes for all while reducing health care costs

- Prioritize research investments in technologies that have the potential to accelerate the pace of discovery in the life sciences, especially imaging, bioinformatics, and high-throughput biology.
- Prioritize investments to reduce the time needed to develop vaccines for future pandemics, consistent with the President’s Council of Advisors on Science and Technology’s recommendations on Influenza Vaccinology.

Moving toward a clean energy future to reduce dependence on energy imports while curbing greenhouse gas emissions

- Prioritize investments in the research and development of clean energy technologies, especially solar energy, next-generation biofuels, and sustainable green buildings and building retrofit technologies.
- Prioritize R&D on advanced vehicle technologies, particularly modeling and simulation of lightweight materials and their manufacturing processes, batteries, and hybrid power trains; and systems integration and demonstration of advanced vehicle platforms.

Understanding, adapting to, and mitigating the impacts of global climate change

- Support, within coordinated interagency investments in the U.S. Global Change Research Program, an integrated and continuing National Climate Assessment of climate change science, impacts, vulnerabilities, and response strategies, including mitigation and adaptation.
- Prioritize research for measuring, reporting and verifying greenhouse gas emissions.

Managing the competing demands on land, fresh water, and the oceans for the production of food, fiber, biofuels, and ecosystem services based on sustainability and biodiversity

- Support research on integrated ecosystem management approaches that bring together biological, physical, chemical, and human uses data into forecast models, assessments and decision support tools.

- Develop and deploy integrated ocean observing capabilities to support ecosystems-based management, including under conditions of changing climate and multiple stressors (*e.g.*, oil spills).

Developing the technologies to protect our troops, citizens, and national interests

- Support cybersecurity R&D to investigate novel means for designing and developing trustworthy cyberspace—a system of defensible subsystems that operate safely in an environment that is presumed to be compromised. Agencies should respond to the call in the President’s Cyberspace Policy Review for R&D in game-changing technologies, including moving target defense strategies, tailored trustworthy spaces, and cyber incentives.
- Prioritize investments in a comprehensive national R&D program to support continued progress toward a world free of nuclear weapons, including expanded work on verification technologies and the development of transparency measures, as outlined in the Nuclear Posture Review.
- Support investments in chemical and biological agent defenses with an interagency effort to improve the Nation’s ability to defend against the use of high-threat agents as weapons.

Addressing these challenges will require strengthening our efforts in six cross-cutting areas:

- Science, technology, engineering and mathematics (STEM) education and advanced learning technologies at every level, from early childhood to lifelong learning, and for all segments of society;
- The vitality and productivity of our research universities and national and private laboratories, and sustained support for fundamental research;
- The capacity and robustness of infrastructures for information and communication, transportation, and energy;
- High-impact collaborations with researchers, the private sector, universities and other institutions of higher learning, civil society, and international partners to achieve U.S. foreign policy, global health, energy, climate change, and global development objectives;
- Capabilities in space, which are germane not only to looking and exploring outward but also to Earth observation, geopositioning, communication, and more; and
- An economic and policy environment that promotes and rewards research, entrepreneurship, and innovation.